

# PATENT ABSTRACTS OF JAPAN

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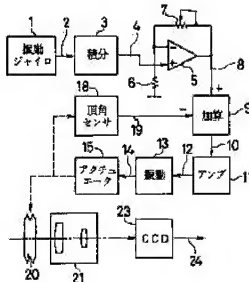
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## (54) PHOTOGRAPHIC DEVICE

### (57)Abstract:

**PURPOSE:** To excellently correct a camera-shake over all area of the distance capable of photographing by setting the ratio of the deflection angle of an optical axis to the output of the detection of a changed angle in a posture for a specific value and making a camera-shake correction into an overcorrection state.

**CONSTITUTION:** The apex angle of a variable apex angle prism 20 is detected by an apex angle sensor 18 to obtain an apex angle signal 19. The apex angle signal 19 and angular displacement signal 4 of the reverse polarity are added to an adding circuit 9 and the obtained differential signal 10 is outputted. The difference signal 10 is amplified by an amplifier 11, turned into a signal 12 and further, a driving signal 14 via a driving circuit 13 and used as a signal for driving an actuator 15. At this time, the ratio of the apex angle of the variable apex angle prism 20 to the angular displacement signal 4 outputted from an integration circuit 3 is set to be  $\geq 1$ , that is, the gain of a variable amplifying level amplifier is set so as to obtain an overcorrection with respect to the angle of the camera-shake generated



in an actual photographing state.

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**Notes:**

1. Untranslatable words are replaced with asterisks (\*).
2. Texts in the figures are not translated and shown as is.

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Dictionary: Last updated 02/16/2006 / Priority: 1. Electronic engineering / 2. Mechanical engineering / 3. Mathematics/Physics

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## FULL CONTENTS

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### [Claim(s)]

[Claim 1] A posture change angle detection means to detect the change angle of the posture of photography equipment, and the optical-axis angle-of-deviation means, to which the angle of deviation of the optical axis of the incoming beams to a photographing optical system is carried out, Photography equipment characterized by establishing a setting means to set the ratio of the amount of angle of deviation of said optical-axis angle-of-deviation means to the detection output of said posture change angle detection means as the value exceeding 1 in photography equipment equipped with the control means which controls said optical-axis angle-of-deviation means according to the detection output of said posture change angle detection means.

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to improvement of photography equipment equipped with the control means which controls an optical-axis angle-of-deviation means according to detection outputs of a posture change angle detection means, such as a video camera.

#### [0002]

[Description of the Prior Art] Drawing 4 is the block diagram showing the outline composition of conventional photography equipment.

[0003] In drawing 4, 101 is a vibration gyroscope which detects the angle-of-deviation speed added to photography equipment, and outputs the angular velocity signal 102. 103 is an integrating circuit, integrates with the angular velocity signal 102, and outputs the angular displacement signal 104. This angular displacement signal 104 shows the angular displacement of photography equipment. 120 is a variable vertex angle prism which is an

optical-axis angle-of-deviation means, and is changed in the vertex angle by an actuator 115.  
 [0004] The vertex angle of the above-mentioned variable vertex angle prism 120 is detected by the vertex angle sensor 118, and acquires the vertex angle signal 119. This vertex angle signal 119 and the above-mentioned angular displacement signal 104 are added to the adder 109 by reversed polarity, and that differential signal 110 is outputted. This differential signal 110 is amplified with amplifier 111, turns into a signal 112, becomes in the driving signal 114 through the drive circuit 113 further, and is used as a signal which drives an actuator 115. That is, the closed loop is formed with the composition from the adder 109 to the vertex angle sensor 118 (vertex angle signal 119).

[0005] With this composition, in order that control that the differential signal 110 always becomes zero may work, it acts so that the vertex angle signal 119 may be in agreement with the angular displacement signal 104 as a result.

[0006] Moreover, image formation of the light which leaned with the variable vertex angle prism 120 is carried out by the lens group 121 on the 123rd page of CCD, and the imaging signal 124 is acquired.

[0007] Drawing 5 or drawing 8 is drawing for explaining the trouble in equipment conventionally [ above-mentioned ].

[0008] Drawing 5 shows the state where the photographic subject Q is carrying out image formation to image Q' by the lens group 121 at the time of the vertex angle zero of the variable vertex angle prism 120.

[0009] At this time, it is S. : Distance S' from a photographic subject Q to the front side principal point of the lens group 121: Distance n from the backside principal point of the lens group 121 to an image surface : It is considered as the refractive index of the variable vertex angle prism 120.

[0010] Drawing 6 rotates photography equipment only an angle theta in the central point A of the variable vertex angle prism 120. According to the angle signal detected by the posture change angle detection means (the vibration gyroscope 101 and the integrating circuit 103 are equivalent to this), the vertex angle of the variable vertex angle prism 120 is set as d, and the state where image Q' carried out image formation to the same position as drawing 5 on CCD123 is shown.

[0011] At this time, it is  $\alpha = \theta / (n - 1)$ .

It is \*\*\*\*\*.

[0012]

[Problem to be solved by the invention] However, since this kind of photography equipment serves as a form which a lens part is arranged at the point of apparatus as generally shown in drawing 7 , and holds the side piece of this apparatus by hand, When a hand deflection occurs, it will not be in a rotation state as shown in drawing 6 , but it will be in the state of

rotating focusing on the grip part which only distance L left from a lens head (variable vertex angle prism 120).

[0013] The image formation state at that time is shown in drawing 8 .

[0014] At this time, photography equipment is rotating only the angle theta at the point B which only distance L separated from the center of the variable vertex angle prism 120, and the vertex angle of the variable vertex angle prism 120 serves as an angle alpha according to the angle signal detected by the posture change angle detection means, and is in the state where it is amending.

[0015] however -- variable -- a vertex angle -- a prism -- 120 -- a point -- B -- a center -- rotating -- "L-tan -- theta -- " -- only -- shifting -- \*\*\*\* -- a sake -- a photographic subject -- Q -- an image -- Q -- ' -- drawing 5 -- being shown -- a position -- from -- L-tan -- theta/S-S -- ' -- having separated -- a position -- image formation -- carrying out -- \*\*\*\* . Since the variable vertex angle prism 120 has already performed "S'andtantheta" amendment, it is the amendment remainder at this time. (L-tan theta/S) -S'/S' and tan theta=L/S ..... (1)

It becomes.

[0016] As shown in the above-mentioned (1) formula, about the photographic subject of "S->infinity, i.e., infinite distance," the influence by the difference in the center of rotation is lost, but the amendment remainder will occur in the photographic subject in limited distance.

[0017] It is only the photographic subject of infinite distance that hand shake correction is thoroughly effective, and this shows that the amendment remainder increases in inverse proportion to distance as a photographic subject approaches at a short distance.

[0018] (The purpose of invention) The purpose of this invention is to offer the photography equipment which can perform good hand shake correction in the distance whole region which can be photoed.

[0019]

[Means for solving problem] This invention establishes a setting means to set the ratio of the amount of angle of deviation of an optical-axis angle-of-deviation means to the detection output of a posture change angle detection means as the value which changes 1, and he is trying to be in the state of fault amendment of the shake compensating to the detection output of a posture change angle.

[0020]

[Working example] This invention is hereafter explained in detail based on the work example of a graphic display.

[0021] Drawing 1 is the block diagram showing the outline composition of the photography equipment in one work example of this invention, and in drawing 1 , 1 is a vibration gyroscope which detects the angle-of-deviation speed added to photography equipment, and outputs the angular velocity signal 2. 3 is an integrating circuit, integrates with the angular velocity signal 2,

and outputs the angular displacement signal 4. This angular displacement signal 4 shows the angular displacement of photography equipment. 5 is operational amplifier, forms variable amplification degree amplifier by composition of resistance 6 and the variable resistance 7, and sets up the amount of fault amendments with the set point of the variable resistance 7. 20 is a variable vertex angle prism which is an optical-axis angle-of-deviation means, and is changed in the vertex angle by an actuator 15.

[0022] The vertex angle of the above-mentioned variable vertex angle prism 20 is detected by the vertex angle sensor 18, and acquires the vertex angle signal 19. This vertex angle signal 19 and the above-mentioned angular displacement signal 4 are added to the adder 9 by reversed polarity, and that differential signal 10 is outputted. This differential signal 10 is amplified with amplifier 11, turns into a signal 12, becomes in the driving signal 14 through the drive circuit 13 further, and is used as a signal which drives an actuator 15. That is, the closed loop is formed with the composition from the adder 9 to the vertex angle sensor 18 (vertex angle signal 19).

[0023] With this composition, in order that control that the differential signal 10 always becomes zero may work, it acts so that the vertex angle signal 19 may be in agreement with the angular displacement signal 4 as a result.

[0024] Moreover, image formation of the light which leaned with the variable vertex angle prism 20 is carried out by the lens group 21 on the 23rd page of CCD, and the imaging signal 24 is acquired.

[0025] In addition, the above-mentioned shake compensating system consists of two lines, pitching (longitudinal direction of a screen), and yawing (cross direction of a screen), and in distinguishing especially, henceforth, a is attached to yawing, the subscript of b is attached to pitching, and it expresses.

[0026] Drawing 2 is the exploded perspective view showing the composition of the variable vertex angle prism 20 and its neighborhood.

[0027] Transparent sheets, such as glass or a plastic, the frame on which 201a and 201b pasted up 202a, and 202b pasted up transparent sheets 201a and 201b, It is the bellows shape film with which 203a and 203b inherit the reinforced ring of Frames 202a and 202b, and 204 inherits Frames 202a and 202b, and the liquid of the high refractive index which is not illustrated is enclosed and the variable vertex angle prism 20 is constituted. In addition, although the transparent sheet 201a, Frame 202a, and the reinforced ring 203a do not attach the sign, it is located in the transparent sheet 201b, Frame 202b, the reinforced ring 203b, and the position that countered, respectively.

[0028] The variable vertex angle prism 20 is pinched by Frames 206a and 206b, and each field is supported by the support pins 207a and 208a, and 207b and 208b so that it may be rockable to the circumference of a yaw axis (X-X) and a pitch (Y-Y). Screw conclusion of each support

pin is carried out at the equipment stationary-portion material which is not illustrated.

Moreover, the yaw axis (X-X) and the pitch axis (Y-Y) are arranged in the medium surface of the variable vertex angle prism 20.

[0029] The flat form coil 151a adheres to the back side frame object 206a at the end, the both sides are countered, the permanent magnet 152a and Yokes 153a and 154a are arranged, the closed magnetic circuit is formed, and the actuator 15 is constituted.

[0030] Moreover, the slit sheet 181a which has a slit opening in Frame 206a is attached, the light emitting device 182a and the photo detector 183a are arranged at the both sides, and the vertex angle sensor 18 is constituted. After the flux of light emitted from the light emitting device 182a penetrates a slit opening, the photo detector 183a glares. Here, the light emitting devices 182a are infrared elements, such as iRED, and the photo detectors 183a are photoelectric transducers, such as PSD from which an output changes with the spot positions of the flux of light which received light, for example.

[0031] And when a slit opening moves between the light emitting devices 182a and the photo detectors 183a which were fixed to equipment stationary-portion material according to rocking of Frame 206a, the spot position on the photo detector 182a can change, and the rocking angle of Frame 206a can be taken out as a vertex angle signal 19.

[0032] Next, the gain setting of the variable amplification degree amplifier which consists of the operational amplifier 5 and resistance 6 which are shown in drawing 1, and variable resistance 7 is explained.

[0033] Now, an optical system with a 1/2-inch image sensor (image field of 4.8x6.4mm<sup>2</sup>) and a focal length of  $f = 100\text{mm}$  is considered, and it is considered as the distance of  $L = 1\text{cm}$  to the grip part and variable vertex angle prism center which are shown in drawing 7. The rate of the amendment remainder shown in the size of a photographic subject and the above-mentioned (1) formula which carry out image formation on an imaging surface about the photographic subject distance 3m, 10m, and 25m at that time is shown in drawing 3.

[0034] "The photographic subject distance 3m, 10m, and 25m" is the distance to which the rise of a face, the upper half of the body, and a child's whole body are reflected to the limit of the length of a screen, respectively, i.e., the distance considered to usually take a photograph frequently. The "amendment remaining \*\*\*" is the gain of the above-mentioned variable amplification degree rise a rate of the amendment remainder at the time of being referred to as "1", and [ this example ] When an amplifier gain is set to "1.01" and resistance 6 is set to "R (omega)", the variable resistance 7 is set as "0, 01R (omega)", and the rate of the amendment remainder has become "0" in the photographic subject distance of 10m, as shown in the "amendment remaining \*\*."

[0035] Moreover, [ when an activity optical system is a zoom lens, will expand the photographic subject distance photoed as a focal length becomes short to the short distance

side, and the amount of amendment remainder will increase, but ] The amount of hand deflections which appears on a screen can acquire the effect of hand shake correction good on the whole in the focal length at the time of the maximum looking far by setting up a rise gain decreasing the amount of amendment remainder on real photography, in order to decrease in proportion to a focal length.

[0036] According to this example, the ratio of the amount of vertex angles of the variable vertex angle prism 20 to the angular displacement signal 4 outputted from the integrating circuit 3 More than "1" Namely, since he is trying to set up the gain of variable amplification degree amplifier to become fault amendment to the hand deflection angle generated in a real photographing state, It becomes possible to perform amendment of the hand deflection at the time of the photography made by maintenance like drawing 7 good in the distance (limited distance which can be photoed) whole region which can be photoed.

[0037] (Modification) In this example, although the system using the variable vertex angle prism 20 as an optical-axis angle-of-deviation means was explained, it cannot be overemphasized by rotating one group in a lens group eccentricity (parallel translation) or focusing on a certain point that composition also with that same to which the angle of deviation of the optical axis is carried out is possible.

[0038]

[Effect of the Invention] He establishes a setting means to set the ratio of the amount of angle of deviation of an optical-axis angle-of-deviation means to the detection output of a posture change angle detection means as the value which changes 1, and is trying to be in the state of fault amendment of the shake compensating to the detection output of a posture change angle according to this invention, as explained above.

[0039] Therefore, it becomes possible to perform good hand shake correction in the distance whole region which can be photoed.

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the outline composition of the photography equipment in one work example of this invention.

[Drawing 2] It is the exploded perspective view showing the composition of the variable vertex angle prism of drawing 1 , and its neighborhood.

[Drawing 3] It is drawing for explaining the effect in one work example of this invention.

[Drawing 4] It is the block diagram showing the outline composition of conventional photography equipment.

[Drawing 5] It is the optical system arrangement plan showing the state where image formation



of the photographic subject is carried out by the lens group at the time of the vertex angle zero of the variable vertex angle prism of drawing 4 .

[Drawing 6] When photography equipment rotates only an angle  $\theta$  in the central point A of a variable vertex angle prism from the state of drawing 5 , it is the optical system arrangement plan showing the state where it was considered as the same image position as drawing 5 .

[Drawing 7] It is the perspective view showing the maintenance state of the photography equipment at the time of general photography.

[Drawing 8] It is the optical system arrangement plan showing the state when performing hand shake correction in the state of drawing 7 .

[Explanations of letters or numerals]

1 Vibration Gyroscope

3 Integrating Circuit

5 Operational Amplifier

6 Resistance

7 Variable Resistance

15 Actuator

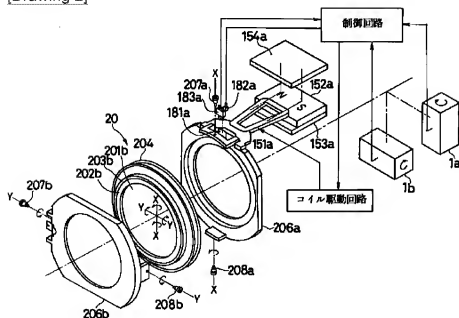
18 Vertex Angle Sensor

20 Variable Vertex Angle Prism

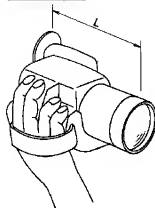
21 Lens Group

23 CCD

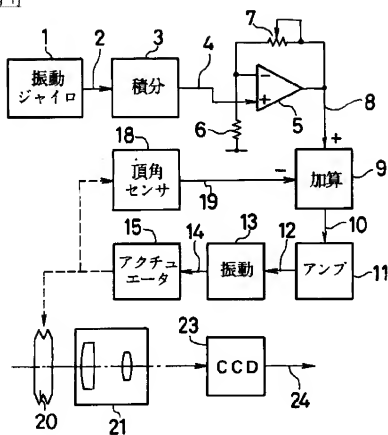
[Drawing 2]



[Drawing 7]



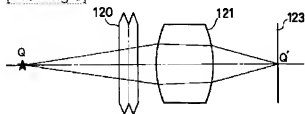
[Drawing 1]



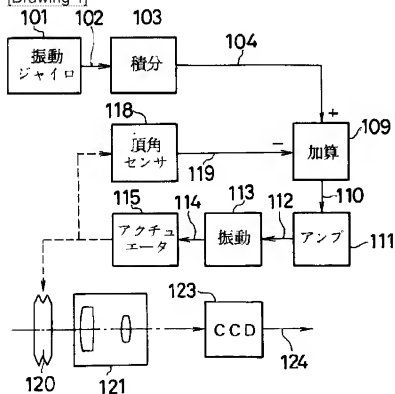
[Drawing 3]

被写体距離	3 m	1 0 m	2 5 m
被写体の大きさ	約1 5 c m (顔のアップ)	約4 8 c m (上半身)	約1 2 0 c m (子供の全身)
補正残り①	0.0 3 3	0.0 1	0.0 0 4
補正残り②	0.0 2 3	0	-0.0 0 6

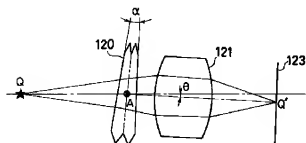
[Drawing 5]



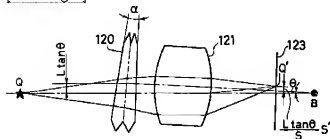
[Drawing 4]



[Drawing 6]



[Drawing 8]



----- [Written Amendment]

[Filing Date] Heisei 5(1993) August 6

[Amendment 1]

[Document to be Amended] Description

[Item(s) to be Amended] 0006

[Method of Amendment] Change

[Proposed Amendment]

[0006] Moreover, image formation of the light by which the angle of deviation was carried out with the variable vertex angle prism 120 is carried out by the lens group 121 on the 123rd page of CCD, and the imaging signal 124 is acquired.

[Amendment 2]

[Document to be Amended] Description

[Item(s) to be Amended] 0010

[Method of Amendment] Change

[Proposed Amendment]

[0010] Drawing 6 rotates photography equipment only an angle theta in the central point A of the variable vertex angle prism 120. According to the angle signal detected by the posture change angle detection means (the vibration gyroscope 101 and the integrating circuit 103 are equivalent to this), the vertex angle of the variable vertex angle prism 120 is set as alpha, and

the state where image Q' carried out image formation to the same position as drawing 5 on CCD123 is shown.

[Amendment 3]

[Document to be Amended] Description

[Item(s) to be Amended] 0019

[Method of Amendment] Change

[Proposed Amendment]

[0019]

[Means for solving problem] This invention establishes a setting means to set the ratio of the amount of angle of deviation of an optical-axis angle-of-deviation means to the detection output of a posture change angle detection means as the value exceeding 1, and he is trying to be in the state of fault amendment of the shake compensating to the detection output of a posture change angle.

[Amendment 4]

[Document to be Amended] Description

[Item(s) to be Amended] 0033

[Method of Amendment] Change

[Proposed Amendment]

[0033] Now, an optical system with a 1/2-inch image sensor (image field of 4.8x6.4mm<sup>2</sup>) and a focal length of  $f = 100\text{mm}$  is considered, and it is considered as the distance of  $L = 10\text{cm}$  to the grip part and variable vertex angle prism center which are shown in drawing 7. The rate of the amendment remainder shown in the size of a photographic subject and the above-mentioned (1) formula which carry out image formation on an imaging surface about the photographic subject distance 3m, 10m, and 25m at that time is shown in drawing 3.

[Amendment 5]

[Document to be Amended] Description

[Item(s) to be Amended] 0034

[Method of Amendment] Change

[Proposed Amendment]

[0034] "The photographic subject distance 3m, 10m, and 25m" is the distance to which the rise of a face, the upper half of the body, and a child's whole body are reflected to the limit of the length of a screen, respectively, i.e., the distance considered to usually take a photograph frequently. The "amendment remaining \*\*\*" is the gain of the above-mentioned variable amplification degree rise a rate of the amendment remainder at the time of being referred to as "1", and [ this example ] When an amplifier gain is set to "1.01" and resistance 6 is set to "R ( $\omega$ )", the variable resistance 7 is set as "0.01R ( $\omega$ )", and the rate of the amendment remainder has become "0" in the photographic subject distance of 10m, as shown in the

"amendment remaining \*\*."

[Amendment 6]

[Document to be Amended] Description

[Item(s) to be Amended] 0038

[Method of Amendment] Change

[Proposed Amendment]

[0038]

[Effect of the Invention] He establishes a setting means to set the ratio of the amount of angle of deviation of an optical-axis angle-of-deviation means to the detection output of a posture change angle detection means as the value exceeding 1, and is trying to be in the state of fault amendment of the shake compensating to the detection output of a posture change angle according to this invention, as explained above.

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[Translation done.]